

Appl. No. 10/056,149
Amendment dated May 04, 2005
Reply to Office Action of Feb. 04, 2005
Docket No. JP9-2000-0337 (291)

Amendments to Claims:

This listing of claims will replace all prior versions and listings of claims in the instant application:

Listing of Claims:

1. (Currently Amended) A speech recognition apparatus comprising:
 - a transformation processor configured to transform at least one phoneme sequence included in speech into at least one word sequence, and to provide, for said word sequence, an appearance probability indicating that said phoneme sequence originally represented said word sequence;
 - a renewal processor configured to renew said appearance probability, provided for said word sequence by said transformation processor, based on a renewed numerical value indicated by language models corresponding to said word sequence provided by said transformation processor; and
 - a recognition processor configured to recognize speech by selecting one of said word sequences for which the renewed appearance probability is the highest to indicate that said phoneme sequence originally represented said selected word sequence;
- wherein said renewal processor calculates said renewed numerical value using a first language model, which is especially prepared for expressions unique to spontaneous speech, and a second language model, which differs from said first language model, and employs said renewed numerical value to renew said appearance probability, wherein said first language model and second language model are utilized together to detect disfluencies and to automatically remove the disfluencies from said at least one word sequence, and wherein the renewed

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numerical value adjusts the appearance probability for a word sequence that results from the detected disfluencies being removed.

2. (Original) The speech recognition apparatus according to claim 1, wherein said first language model represents a probability that said word sequence, which includes a predetermined word included in an expression unique to spontaneous speech, is said word sequence or said originally represented phoneme sequence.

3. (Currently Amended) The speech recognition apparatus according to claim 2, wherein, when said predetermined word is included in the speech recognition results, said transformation processor transforms said phoneme sequence into a word sequence ~~included~~ including in said predetermined word, and said renewal processor renews the appearance probabilities of said word sequence based on said first language model and said second language model.

4. (Currently Amended) The speech recognition apparatus according to claim 1, wherein said first language model employs, as an element, a word set including ~~[[a]] a plurality of disfluency disfluencies and wherein said first language model is configured to be turned off using an associated on/off controller, said speech recognition apparatus not automatically removing the disfluencies from said at least one word sequence when said first language model is turned off.~~

5. (Original) The speech recognition apparatus according to claim 1, wherein said first and said second language models are defined as N-gram models, and wherein said renewal processor employs, as said renewed numerical value, the weighted average value of said first and said second language models.

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6. (Original) A computer system comprising the speech recognition apparatus according to claim 1.

7. (Currently Amended) A speech recognition method comprising:
transforming at least one phoneme sequence included in speech into at least one word sequence, and providing an appearance probability for said obtained word sequence indicating that said phoneme sequence originally represented said word sequence;

renewing said appearance probability provided for each of said word sequences when said word sequence obtained at said transformation step include a word unique to spontaneous speech, referring to a first model, which is especially prepared for an expression unique to spontaneous speech, and a second model, which differs from said first model; and

recognizing said speech and selecting one of said word sequences for which the renewed appearance probability is the highest, to indicate that said phoneme sequence originally represented said selected word sequence, wherein said first model and second model are utilized together to detect disfluencies and to automatically remove the disfluencies from said at least one word sequence, and wherein said appearance probability is adjusted in said renewing step for a word sequence that results from the detected disfluencies being removed.

8. (Original) The speech recognition method according to claim 7, further comprising:

writing said first language model in correlation with the appearance probability of a word sequence which includes a word unique to spontaneous speech with a combination of N consecutive words.

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9. (Currently Amended) The speech recognition method according to claim 8, wherein said word unique to spontaneous speech is a disfluency and wherein said first language model is configured to be turned off using an associated on/off controller, said speech recognition method not automatically removing the disfluencies from said at least one word sequence when said first language model is turned off.

10. (Original) The speech recognition method according to claim 7, wherein said renewing step further comprises:

renewing said appearance probability provided for said word sequence by referring to a third language model, which is especially prepared for specific symbols included in said word sequence or sequences.

11. (Currently Amended) A program that permits a computer to perform:
acoustically analyzing speech data and transforming said speech data into a feature vector;

generating acoustic data, for which an appearance probability is provided, for at least one phoneme sequence that may correspond to said feature vector obtained from said analyzing step;

transforming said phoneme sequence into at least one word sequence, while a disfluency is included as a word choice selection;

renewing said appearance probability by referring to a disfluency language model that is written by correlating the appearance probability of at least one word sequence in which a disfluency is included with a combination of N consecutive words, wherein the renewing step also refers to a second language model not including disfluencies, wherein said renewing step results in at least one sequence of words in which said disfluency is not included; and

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speech recognizing said speech data by using as a speech recognition result one of said word sequences for which the renewed appearance probability is the highest, wherein said disfluency language model and said second model are utilized together to detect disfluencies and to automatically remove the disfluencies.

12. (Original) The program according to claim 11, wherein said transforming step further comprises:

adding a symbol to a word indicating that said word is a disfluency choice to distinguish said word choice from another word.

13. (Original) The program according to claim 11, wherein said speech recognizing step further comprises:

outputting said word sequence to which the highest appearance probability applies as text data.

14. (Original) The program according to claim 12, wherein said speech recognizing step further comprises;

removing said word to which said symbol has been added from said word sequence having the highest appearance probability, and outputting the resultant word sequence as text data.

15. (Original) The program according to claim 11, wherein said renewing step further comprises:

renewing said appearance probability by referring to said disfluency language model and to a general-purpose language model.

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16. (Original) The program according to claim 11, wherein said transforming step further comprises:

transforming said phoneme sequence into a word sequence, while a pause included in said speech data is included as a punctuation choice, and renewing said appearance probability by further referring to a punctuation language model that is limited to punctuation insertion.

17. (Currently Amended) A machine-readable storage, having stored thereon a computer program having a plurality of code sections executable by a machine for causing the machine to perform the steps of:

acoustically analyzing speech data and transforming said speech data into a feature vector;

generating acoustic data, for which an appearance probability is provided, for a phoneme sequence that may correspond to said feature vector obtained by said analyzing step;

if a disfluency is to be reflected in a recognition result, transforming said phoneme sequence into a word sequence, with a disfluency being included as a word choice, or if a disfluency is not to be reflected in a recognition result, transforming said phoneme sequence into a word sequence without including said disfluency as a word choice;

if a disfluency is to be reflected in a recognition result, renewing said appearance probability by referring to the general-purpose language model and a disfluency language model, which is written by correlating the appearance probability of said word sequence that includes a disfluency with a combination of N consecutive words, or if a disfluency is not to be reflected in a recognition result renewing said appearance probability by referring to the general-purpose language model; and

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speech recognizing said speech data by using said word sequence for which the renewed appearance probability is the highest as a speech recognition result, wherein said general-purpose language model and disfluency language model are utilized together to detect disfluencies and to automatically remove the disfluencies from said at least one word sequence, and wherein said disfluency language model is configured to be turned off using an associated on/off controller, said computer program not automatically removing the disfluencies when said disfluency language model is turned off.

18. (Original) The machine-readable storage according to claim 17, wherein said transforming step further comprises:

adding a symbol to a word indicating that said word is a disfluency word choice to distinguish between said word and another.

19. (Original) The machine-readable storage according to claim 17, wherein said disfluency language model and said general-purpose language model are N-gram models; and wherein, at said renewing step, said appearance probability is renewed by using the weighted average value of said disfluency language model and said general-purpose language model.

20. (Original) The machine-readable storage according to claim 17, wherein said transforming step further comprises:

transforming said phoneme sequence into a word sequence, while a pause is included as a punctuation choice in said speech data, and renewing said appearance probability by referring to a punctuation language model that is limited to punctuation insertion, to automatically insert punctuation in a speech recognition result.